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Evaluating Student-Teacher Linkage Data in Teacher Incentive Fund (TIF) Sites:

Acquisition, Verification, and System Development

The Harvesting Project

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Abstract

The U.S. Department of Education Teacher Incentive Fund (TIF) seeks to transform education compensation systems so that principal and teacher performance (measured through classroom productivity measures) connects to compensation. Classroom-level productivity measures require robust student-teacher linkage data. Organizations such as the Value-Added Research Center, the Data Quality Campaign, and Battelle for Kids have recently been paying a great deal of attention to data quality. This paper presents findings from an exploratory study of eight TIF grantees and discusses how they acquired, verified, and managed their student-teacher linkage data through system development. Findings suggest that (a) grantees have multiple avenues for linkage data acquisition, and (b) all TIF grantees must devote considerable effort to verifying the validity of student-teacher linkage data. Furthermore, most of the TIF grantees included in this study are making progress in system development. This paper summarizes findings as a series of six lessons learned that may inform future and on-going compensation reform projects.

Purpose and Objectives of the Study

This paper reports on the ways in which Teacher Incentive Fund (TIF) grantees have collected, verified, and managed student-teacher linkage data to meet their TIF project needs. While this paper will benefit and inform current and future TIF grantees, it will also benefit districts and states that are committed to measuring student growth at the classroom level. In other words, this paper should be relevant to any district attempting to develop classroom-level measures of productivity (e.g., value-added) because these measures demand that analysts and leaders have access to high-quality student-teacher linkage data. This paper uses a framework for data quality that is informed by Watson, Kramer, & Thorn (2009) as well as organizations like the Data Quality Campaign (DQC, 2007; DQC 2010) and Battelle for Kids (2009). This framework focuses on the following areas of inquiry:

A. Acquisition of student-teacher linkage data

B. Verification of student-teacher linkage data

C. Systems development to improve and sustain quality of student-teacher linkage data

Through these areas, the authors examine the capacity of TIF grantees to collect student-teacher linkage data and maintain student-teacher linkage data quality.

TIF, established in 2006, marked the first federal initiative to reform teacher and principal

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compensation systems. TIF aims to increase the number of quality teachers in high-poverty schools and reward teachers and principals for improved student achievement (U.S. Department of Education, 2008). In 2007, the U.S. Department of Education awarded $99 million to 34 school systems around the nation to design and implement strategic compensation programs (U.S. Department of Education, 2008). These 34 TIF programs affect approximately 55,000 teachers and 2,500 principals in 18 states and include 109 school districts. Congress expanded funding for the program in FY 2010 with an additional appropriation of $437 million, and the Department of Education finalized a third round of funding for 62 additional grantees (including some continued support for existing grantees) in late September 2010.

All TIF projects have significant information technology (IT) requirements because grantees must be able to draw data needed to make merit-pay decisions from a variety of sources (e.g., human resources systems, student information systems, and teacher and principal observation records). Data quality problems that may be isolated in individual data systems can magnify as states and districts integrate data across systems and use them for high-stakes decisions. In particular, data about which teachers are teaching each content area to which students are particularly important to TIF projects. While school systems usually determine performance-based compensation using multiple measures, classroom-level measures of productivity account for 33% to 50% of the performance-based compensation determination under many of the plans currently in place. Consequently, without high-quality student-teacher data, TIF programs will struggle to make even the most basic progress toward compensation reform because they will be unable to connect the production of learning with the knowledge of educators in their system (Thorn, 2001).

Methodology of the Study

The TIF program includes 33 grantees from the original grantee cohorts. We purposefully selected 8 of the 33 for this study based on their size, type of measurement, and award determination. (See http://cecr.ed.gov/initiatives/grantees/profiles.cfm for TIF grantees.) The grantees ranged from small local education agencies (LEAs) to large urban or state education agency (SEA) programs. The type of measurement varied from value added to attainment at the school, grade, and classroom levels. Grantees also varied in the amount and proportion of incentive allocated from test data, teacher evaluation, and other variables.

The authors of this paper work for CECR and have worked with all TIF grantees as technical assistance providers. This project used qualitative methods that included document review (*grant proposals, progress reports, memos, e-mails between CECR technical assistance providers and grantees*) and interviews. We constructed interview protocols to probe the three areas of our data quality framework (*acquisition, validation, and system development*).

We conducted participant interviews over the phone with school and district staff who collect and manage data work for their respective TIF projects. We recorded, transcribed, and loaded the interviews into NVivo 8 for thematic analysis. When possible, we triangulated the reviewed documents with interviews.

Phone interviews with each of the eight grantees (see Table 1 below) provided a rich set of qualitative data from diverse perspectives. Some participants were IT professionals, while others were administrators and practitioners. Additionally, some participants were district employees, while others were external consultants or contractors district(s) hired to develop data system capacity. (Note Table

1 uses pseudonyms for the grantees to protect the confidentiality of interviewees.)

Interviews lasted approximately 40-45 minutes, and we recorded answers by both handwritten notes and digital recording device. Approximately a week before the interview, we provided respondents with a list of eight broad questions in three areas of inquiry. We conducted all interviews over the phone within an eight-day period in 2010. A single interviewer conducted approximately half of the interviews, while two or more colleagues conducted the remainder.

Table 1: Assessments, Measures, and Award Determination for Teacher Performance

Name	# Schools	Type of Measurement		Award Determination* Primary: Largest incentive amount Moderate: Moderate incentive amount Minor: Minor incentive amount
		VA	Attain	
Anderson	11	S,G,C	C	T = Primary E = Minor A = Moderate
Carlsberg	20	C	S,C,G	T = Primary A = Moderate O = Moderate
Dipsonville	230	S,C	S,G,G	T = Primary H + O = Moderate
Evergrace	16	S,C		T = Primary E = Moderate A = Moderate H = Minor
Hillside	104	S,C	C	T = Primary PD = minor
Lakeview	18	S,C	S	T = Primary
Northfork	10	S,G,C	S,C	T = Primary E = Minor A = Minor O = Minor
Ogglethorp	178	S,C		T = Primary E = Moderate A = Moderate PD = Moderate
Sentinel	46	S,C	S	T = Moderate H = Moderate A = Minor PD = Minor O = Moderate

* S = School-level, G = Grade-level, and C = Classroom-level measures.

**T = % based on test data, E = % based on teacher evaluation data, H = % based on hard-to-staff schools or subjects, A = added responsibility, PD = participation in PD, O = other measures (i.e., National Board Certification, attendance rates, graduation rates).

Findings

Common Themes

Beyond gathering information on each of the three individual focus areas, we identified a number of challenges that were common to all areas and therefore qualify as overall themes. The first of these is the tension between complexity and simplicity, wherein grantees must balance the complex and varied characteristics of student-teacher relationships with the desire to keep their linkage process user-friendly, manageable, and timely.

Another theme is the conflict between systemic approaches to data management and departmentalized approaches, wherein grantees must make tough decisions about the level of individualization that each system should allow. Allowing for detailed local differences in programs can radically increase complexity and challenge efforts to collect comparable data.

A third tension involves the choice between point-in-time data and real-time data, wherein grantees must weigh an "ideal" linkage system against the intrusiveness of such a system on teachers, principals, and technology professionals. Readers should keep each of these tensions in mind when reading over the findings.

We focus our findings in three areas: comparing methods of data acquisition, approaches for verifying data accuracy, and analyzing systems development.

Data Acquisition

All participants reported acquiring student-teacher linkage data from internal data systems, typically the district's or state's student information systems used to manage student schedules, attendance, grades, and discipline. Five of the participants reported a remarkably similar overall process, with an additional two grantees reporting only slight variations on this process. Only one grantee uses an entirely unique data acquisition system.

There were several important differences in approaches. For example, one district reported using internal data systems, but only after hiring external partners to manage the process. Two participants reported using both internal data systems and external data systems (i.e., surveys asking teachers to self-report which students they taught). In these cases, districts reported using internal systems to populate electronic surveys which they then administered to teachers to verify student-teacher linkages. Once districts verified the data, they used this external system as the primary source of student-teacher linkage data. One grantee reported using an external data system to harvest student-teacher linkages directly, with no connection to internal systems. Districts developing processes for harvesting student-teacher linkage data should carefully consider if and how external partners might be able to improve how districts harvest student-teacher linkage data.

Data Verification

Of primary importance in any "performance pay" system is establishing accurate links between students and teachers; only by properly attributing scores/gains to the educators who helped create them can grantees ensure the integrity of compensation. It is no surprise, then, that one common theme among the respondents is the pains taken to validate their student-teacher linkage data. Every respondent described plans that involve at least one layer of verification and, in some cases, more. While these processes varied in their design—internal vs. external, individuals vs. committees, administrators vs. teachers—it is clear that every grantee feels that accuracy is a pressing matter.

Table 2. Summary of Findings by Each TIF Grantee and Data Quality Area

Name	# Schools	Links Source	Verification Levels*	Complexity**	Maturity***
Anderson	11	Internal	3	High	Low
Carlsberg	20	Internal	3	Medium	Medium
Dipsonville	230	External	3	Medium	High
Evergrace	16	Internal + consultant	3	Medium	Medium
Hillside	104	Both	4	High	High
Northfork	10	Internal	4+	High	Low
Ogglethorp	178	Both	3	Medium	Medium
Sentinel	46	Internal	1 (Pilot only)	High	Low

* The number of distinct steps/persons grantees use to validate student-teacher links.
** Grantee's system's handling of "atypical" education contexts (e.g., team teaching, student mobility).
*** Level of development of grantee's data system, as a function of time/experience/piloting/live rollout/etc.

While most respondents shared the same general approach to the first issue (seeking a balance between simplicity and complexity), they differed greatly in regard to the second issue—how they treat "atypical" settings such as team teaching or multidisciplinary courses. Some grantees establish arbitrary boundaries to simplify the process; for example, any teacher employed at least 50% FTE is eligible for the same award amounts as a full-time teacher. Some grantees spend resources creating intricate and multi-faceted attribution applications that assign each student individually (for example) to teachers in 10% increments. Some grantees rely on the professionalism of their educators, such as the use of teacher committees to collectively document more complex delivery of instruction. The rationale for using committees to document instruction delivery models is based on the assumption that those committees comprise the same members as the instructional delivery teams, making it more likely that the "team" will accurately attribute instruction to each member in the team. Finally, there is a group of districts that relies on principals to ascribe responsibility to teachers working in more complex settings. In any case, this particular area of student-teacher assignment bears watching, given that the "traditional" one teacher/one classroom/one year model may not be the dominant model of delivery in many locations.

Systems Development

Grantees reported a number of ways in which their TIF project had become a driver for how the grantee strategically leverages his/her information technology infrastructure. In many cases, this focus on systems development extends to external partners like data system vendors and non-profit consultants as well. Grantees reported several ways in which their TIF project had changed how they interacted with internal technical staff. First, TIF grantees needed to understand the capacities and limits of their existing data systems and that staff in charge of overseeing the implementation and maintenance of those systems held that knowledge. Second, TIF grantees reported an overall increase in awareness and focus on the role of data within the grantee's organization. As the perceived importance of student-teacher linkage data increased, so did the desire to ensure that the data were high quality. Third, TIF projects challenged grantees to connect data across previously unlinked data systems and departmental boundaries.

TIF grantees also reported benefits and challenges associated with working with vendors and external partners. On the one hand, these partnerships added significant capacity to grantees in the area of managing and verifying student-teacher linkage data. On the other hand, partnerships sometimes were associated with increased project management complexity. Interviews revealed that sometimes inflexible contract deliverables and poor communication between both vendor and district strained relationships between vendors and schools. However, grantees generally reported more benefits from such partnerships than challenges. Most important, a common element among responses was the idea that the TIF grant mobilized internal improvement and external investment. In this sense, complying with the grant's technology requirements drove innovation and increased grantees' student-teacher links capacity—thereby strengthening the vital and initial link in the performance-based compensation chain.

Lessons Learned

The findings of this project provide valuable lessons to other districts and states seeking to implement compensation reform projects. Some of these lessons focus on organizational and leadership issues. Some are technical demands that arise as TIF projects face the challenge of coordinating how to use technology to implement reformed compensation systems. Other lessons focus on important process and implementation variables. Many are combinations of all three.

Lesson #1:
Plan for systems integration with stakeholder input.

Compensation reform requires TIF grantees to integrate student information system data with human resources and payroll system data within a delivery system that supports verification. Grantees typically obtain student-teacher linkage data from the student information system, but need to integrate these data with data from human resources and payroll systems. However, grantees did not initially have these systems designed with performance-based compensation in mind. Therefore, grantees need to take care to ensure that they do not use the data in ways that are unfounded. For example, some districts may not maintain accurate employee data in their student information system, which would make it difficult to match employee records from the Human Resource system with student-teacher linkage data from the student information system. Including various stakeholders like technical leads, mid-managers, and personnel who know how schools use technology on a day-to-day basis will help roadmap potential problems.

Lesson #2:
Enhance trust and fidelity of student-teacher linkage data with good verification processes.

It is important to realize the purpose and benefits of verification to a TIF project. First, the purpose of verifying student rosters and teacher assignments is to ensure that districts base pay-outs upon data that are as accurate as possible. Verification of student-teacher linkage data allows leaders to manage risks associated with incorrect payouts. Second, the process of verification provides an excellent window to view classroom practices that inextricably connect to measures of student growth. Data systems often do not record team teaching strategies such as shared classrooms, pull-out services, and push-in services. Verifying student-teacher relationships provides TIF grantees with a way of knowing about these approaches so that recipients perceive awards as fair.

Lesson #3:
Maintain balance between nuance and pragmatism in data collection and storage.

Leaders must balance nuances such as measuring team teaching with pragmatism in order to optimize stakeholder buy-in and support while managing the complexity of compensation reform. Leaning too far too fast toward a nuanced data model for student-teacher linkages will increase the validity of the data used to determine pay-outs, but at the expense of significantly increasing project management costs. For example, measuring team teaching over time requires district leaders to query teachers at multiple times; furthermore, analyzing and using these data becomes inherently more complex as team teaching assessments increased in frequency. On the other hand, ignoring real world nuances such as team teaching for the sake of simplicity will likely undermine teacher buy-in and support because stakeholders will know that

the process of merit determination excluded team teaching strategies like pull-out and push-in teaching supports. Leaders should consider ways to gradually increase the data collection methods' sensitivity to nuance over time so that they can spread out capacity-building and make it more manageable.

Lesson #4:
Leverage school personnel for different purposes.

When planning for verification and data collection at the school and classroom levels, TIF leaders should consider what roles each type of school personnel will play. Principals are often an initial point of contact for verifying basic staff assignment and course offerings. Some TIF grantees also use principals to resolve remaining questions about who taught whom after initial assignment by teachers. On the other hand, grantees should also ask teachers to verify their student rosters and inform the district about team teaching. Districts may best manage tasks related to determining which courses qualify for math or reading content areas.

Lesson #5:
Connect TIF projects to IT infrastructure.

Since TIF projects use data from systems not originally designed to inform compensation decisions, it is critical that TIF leaders work closely with information technology specialists and leaders throughout the life cycle of TIF projects. Technical staff may know where many data limitations may lie, as well as ways to mitigate those limitations. Technical staff may be aware of specific ways in which schools use their student information system on a day-to-day basis. This knowledge can help district leaders understand how best to integrate

new tasks into how schools actually use student information systems.

In addition, technical staff should facilitate the integration of data systems (e.g., merging student–teacher linkage data with human resource data). TIF projects provide district technical services leaders with an excellent opportunity to build technical capacity beyond compliance reporting and toward knowledge management and decision support.

Lesson #6:
Use external partners to increase both capacity and overhead.

Many TIF projects interviewed for this study worked closely with external partners such as data system vendors, analytic service providers, and communication specialists. These relationships greatly enhanced district capacity to perform specific tasks such as verifying student-teacher linkage data, reporting award decisions, implementing new data systems, and of course calculating performance metrics.

However, these relationships require management and increase the overhead costs of TIF projects. In some cases, when district staff had difficulty identifying clear roles, deliverables, and communication norms, the costs of managing external partners have outweighed the benefits of the relationship. TIF leaders should think strategically about external partner relationships and plan for those relationships by defining deliverables, timelines, and communication clearly.

Within the domain of performance-based compensation, current and future TIF leaders need to understand how their data systems collect and manage student-teacher linkage data and how

to integrate technical experts into the design and implementation phases of their projects.

Additionally, TIF leaders need to speak with data systems experts about what might compromise the quality of student-teacher linkage data. Watson, Kraemer, and Thorn (2009) provide a rich, real-world description of how some TIF grantees developed and implemented their systems to harvest student-teacher linkages and outline the challenges of connecting student to teachers in increasingly complicated educational contexts.

Conclusions

One major finding of this study was that TIF grantees have needed to engage in capacity-building activities in order to be able to access and manage student-teacher linkage data of sufficient quality. Historically, districts have not designed their data systems to inform high-stakes teacher decisions like performance-based compensation. Instead, districts designed their K12 data systems for funding allocation decisions and compliance reporting. Prior to implementation, most K12 districts simply have not had any reason to systematically collect or validate student-teacher linkage data. New TIF grantees should plan accordingly to address how they will acquire, manage, and validate student teacher linkage data.

Findings also suggest that district data systems are likely capable of establishing initial best guesses about who is teaching whom, although districts may need help in extracting and managing student-teacher linkage data. TIF project leaders should plan to include technical experts, school programming

specialists, and research and reporting staff early in their project design and implementation to best understand their district's capacity to harvest student-teacher linkage data from district data systems. Part of this process will result in decisions about what factors to include or exclude in their TIF design and implementation (e.g., team teaching variables, mobile students).

Findings of this study suggest that districts will likely benefit from external partnerships that help districts acquire, manage, and verify student-teacher linkage data. However, districts must manage these types of partnerships with care, thoughtfulness, and good communication.

Finally, it is worth noting that the utility of student-teacher linkage data should not be limited to districts implementing performance-based compensation systems. Organizations such as the Data Quality Campaign[1] and the Schools Interoperability Framework Association[2] are increasingly focusing on student-teacher linkages as a necessary condition for using data to drive quality and improvement. A burgeoning body of literature is espousing the benefits of accurate student-teacher linkages—benefits such as improved reporting capacity, identification of effective programs and practices, improved feedback systems (DQC, 2007), and improving teacher quality (DQC, 2010). Likewise, Battelle for Kids has also long recognized the importance of accurately linking teachers to students (Battelle for Kids, 2009). While student-teacher linkage data are not the only key factor in understanding what works in education, these data are necessary for attributing outcomes in student achievement to interventions at the teacher level.

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1   www.dataqualitycampaign.org
2   The Schools Interoperability Framework Association (SIFA) is a data-sharing specification originally developed to allow information systems within K-12 districts to exchange data without requiring wholesale replacement of existing systems. See http://www.sifa.org

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